

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

POLAROID CORPORATION,

Plaintiff and Counterclaim Defendant,

v.

HEWLETT-PACKARD COMPANY,

Defendants and Counterclaim Plaintiff.

C.A. No. 06-738-SLR

**DECLARATION OF WILLIAM J. MARSDEN, JR.
IN SUPPORT OF DEFENDANT HEWLETT-PACKARD'S
RESPONSIVE CLAIM CONSTRUCTION BRIEF**

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Dated: January 25, 2008

*Attorneys for Defendant and Counterclaim-Plaintiff
Hewlett-Packard Company*

I, William J. Marsden, Jr., declare as follows:

1. I am an attorney with Fish & Richardson P.C., counsel for Defendant Hewlett-Packard Co. I am a member of the Bar of the State of Delaware and of this Court. I have personal knowledge of the matters stated in this declaration and would testify truthfully to them if called upon to do so.

2. Attached hereto as Exhibit A is a true and correct copy of excerpts from Zalman Usiskin, Cathy Hynes Feldman, Suzanne Davis, Sharon Mallo, Gladys Sanders, David Witonsky, James Flander, Lydia Polonsky, Susan Porter, and Steven S. Viktora, Transition Mathematics (2d ed. 1998).

3. Attached hereto as Exhibit B is a true and correct copy of McGraw-Hill Dictionary of Scientific and Technical Term (4th ed., 1989).

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed this 25th of January, 2008 at Wilmington, Delaware.

/s/ William J. Marsden, Jr.
William J. Marsden, Jr.

CERTIFICATE OF SERVICE

I hereby certify that on January 25, 2008, I electronically filed with the Clerk of Court the foregoing **DECLARATION OF WILLIAM J. MARSDEN, JR. IN SUPPORT OF DEFENDANT HEWLETT-PACKARD'S RESPONSIVE CLAIM CONSTRUCTION BRIEF** using CM/ECF which will send electronic notification of such filing(s) to the following counsel::

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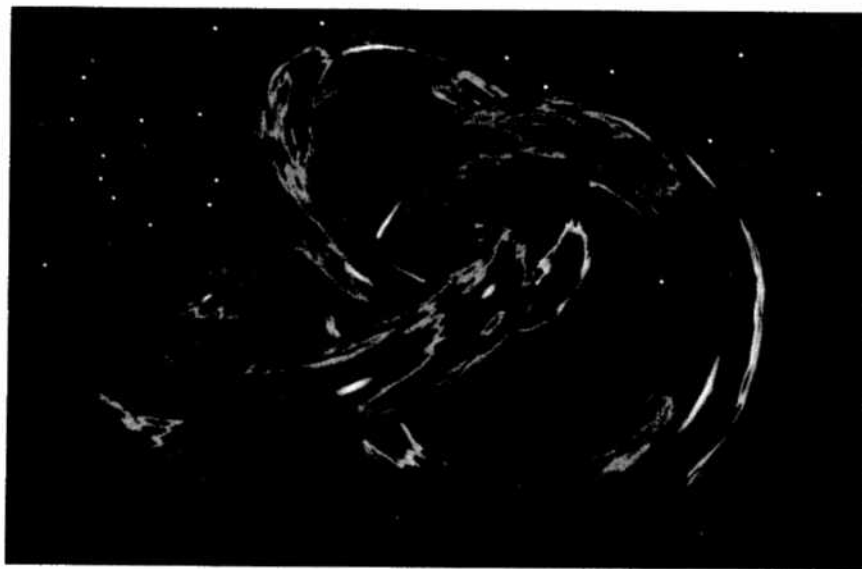
Exhibit A



The University of Chicago School Mathematics Project

Transition Mathematics

Second Edition



About the Cover The art on the cover was generated by a computer. The three interlocking rings signify the major themes of this book—algebra, geometry, and applied arithmetic.

Authors

Zalman Usiskin Cathy Hynes Feldman
Suzanne Davis Sharon Mallo Gladys Sanders David Witonsky
James Flanders Lydia Polonsky Susan Porter Steven S. Viktora



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Design Development

Curtis Design

ISBN: 0-673-45939-X

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We wish to thank the many editors, production
personnel, and design personnel at ScottForesman
for their magnificent assistance.

We wish to acknowledge the generous support of
the Amoco Foundation and the Carnegie
Corporation of New York in helping to make it
possible for the First Edition of these materials
to be developed, tested, and distributed, and the
continuing support of the Amoco Foundation for
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In 6–8, simplify. Show your work.

6. $3[2 + 4(5 - 2)]$

7. $39 - [20 \div 4 + 2(3 + 6)]$

8. $[(3 - 1)^3 + (5 - 1)^4]^2$

9. a. Write a key sequence for evaluating the expression of Question 6 on your calculator.

b. Which do you think is the better method for Question 6: paper and pencil, or calculator? Explain your choice.

10. *Multiple choice.* Written on one line, $\frac{20 + 2 \cdot 30}{6 + 4} =$

(a) $20 + 2 \cdot 30/6 + 4.$

(b) $20 + 2 \cdot 30/(6 + 4).$

(c) $(20 + 2 \cdot 30)/6 + 4.$

(d) $(20 + 2 \cdot 30)/(6 + 4).$

In 11 and 12, simplify. Show each step.

11. $\frac{50 + 40}{50 - 40}$

12. $\frac{560}{7(6 + 3 \cdot 4.5)}$

13. a. Write a key sequence for evaluating Question 12 on your calculator.

b. Which do you think is the better method for doing Question 12: paper and pencil, or calculator?

In 14 and 15, evaluate when $a = 5$ and $x = 4$. Show each step.

14. $\frac{a + 3x}{a + x}$

15. $\frac{5x - 2}{(x - 1)(x - 2)}$

Applying the Mathematics

In 16–19, recall that the **mean** or **average** of a collection of numbers is their sum divided by the number of numbers in the collection.

16. Write an expression for the mean of a , b , c , d , and e .

17. A bookcase has three shelves with 42, 37, and 28 books on them. What is the average number of books on a shelf of this bookcase?

18. A student scores 83, 91, 86, and 89 on 4 tests. What is the average?

19. Grades can range from 0 to 100 on tests. A student scores 85 and 90 on the first two tests.

a. What is the lowest the student can average for all 3 tests?

b. What is the highest the student can average for the 3 tests?

In 20 and 21, show each step in evaluating the expression.

20. $5[x + 2y(3 + 2z)]$ when $x = 1$, $y = 2$, and $z = 3$

21. $\frac{x + 3y}{z} + \frac{4y + z}{3x}$ when $x = 3$, $y = 2$, and $z = 1$

In 22 and 23, insert grouping symbols to make the equation true.

22. $3 + 5 \cdot 6 - 8 \cdot 2 = 80$

23. $3 \cdot 8 - 6/2 + 3 = 12$

24. Write the algebraic expression of Example 4 on one line.

LESSON

11-4

*Division
with
Negative
Numbers*



A negative cash flow. Although a person may spend only 50 cents to play a video game, Americans spend \$5 billion a year playing arcade video games.

Dividing a Negative Number by a Positive Number

A person spends 10 dollars in a video arcade in 2 hours. What is the rate? The answer is given by division.

$$\frac{\text{spend 10 dollars}}{2 \text{ hours}} = \text{spend 5 dollars per hour}$$

You can translate the dollars spent into a negative number.

$$\frac{-10 \text{ dollars}}{2 \text{ hours}} = -5 \frac{\text{dollars}}{\text{hour}}$$

This situation is an instance of the division $\frac{-10}{2} = -5$. Another way to do the division is to think as follows: Dividing by 2 is the same as multiplying by its reciprocal, $\frac{1}{2}$.

$$\frac{-10}{2} = -10 \cdot \frac{1}{2} = -5$$

In general, if a negative number is divided by a positive number, the quotient is negative.

Example 1

On five consecutive days, the low temperatures in a city were 3°C , -4°C , -6°C , -2°C , and 0°C . What was the mean low temperature for the five days?

Solution

Recall that the mean (or average) temperature is found by adding up the numbers and dividing by 5.

$$\frac{3 + -4 + -6 + -2 + 0}{5} = \frac{-9}{5} = -1.8$$

The mean low temperature was -1.8°C , or about -2°C . This temperature is a little below freezing.

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Exhibit B

A
B

McGraw-Hill DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS

Fourth Edition

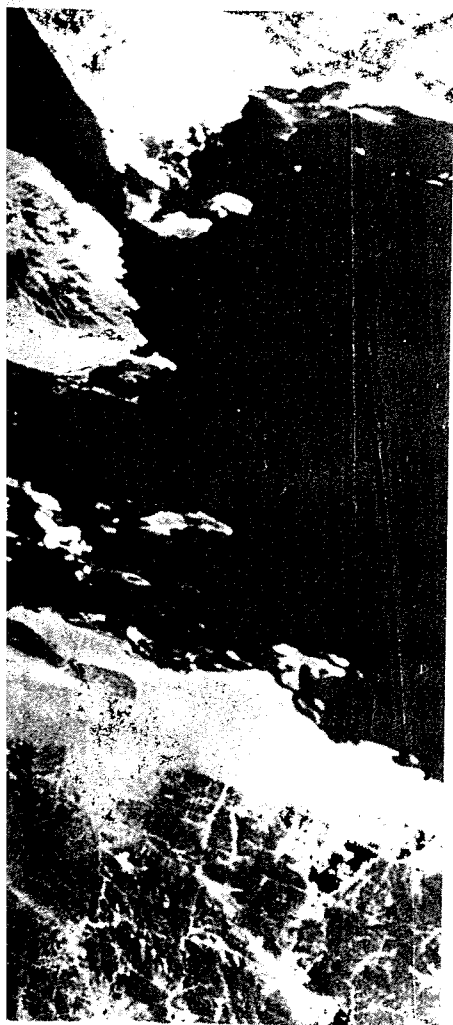
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McGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS, Fourth Edition

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1 2 3 4 5 6 7 8 9 0 DOW/DOW 8 9 5 4 3 2 1 0 9 8

ISBN 0-07-045270-9

Library of Congress Cataloging-in-Publication Data

McGraw-Hill dictionary of scientific and technical terms.

1. Science—Dictionaries. 2. Technology—Dictionaries.
I. Parker, Sybil P.
Q123.M34 1989 503/.21 88-13490
ISBN 0-07-045270-9

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chromatophobia [PSYCH] An abnormal fear of money. {krə,məd-ə'fō-bē-ə}

Christiansen effect [ANALY CHEM] Monochromatic transparency effect when finely powdered substances, such as glass or quartz, are immersed in a liquid having the same refractive index. {kris'chən'sən i'fekt}

Christiansen filter [OPTICS] A type of color filter, a solid-in-liquid suspension, which scatters all incident energy except that of a narrow frequency range out of the direct beam. Also known as band-pass filter. {kris'chən'sən 'fīl-tər}

Christmas disease [MED] A hereditary, sex-linked, hemophilia-like disease involving failure of the clotting mechanism due to a deficiency of Christmas factor. {kris'məs di,zēz}

Christmas factor [BIOCHEM] A soluble protein blood factor involved in blood coagulation. Also known as factor IX; plasma thromboplastin component (PTC). {kris'məs ,fak-tər}

Christmas tree [PETRO ENG] An assembly of valves, tees, crosses, and other fittings at the wellhead, used to control oil or gas production and to give access to the well tubing. {kris'məs ,trē}

Christoffel symbols [MATH] Symbols which represent particular functions of the coefficients and their first-order derivatives of a quadratic form. {kris'tōf-əl ,sim-bəlz}

christophite See marmatite. {kris'tə,fīt}

chroma [OPTICS] 1. The dimension of the Munsell system of color that corresponds most closely to saturation, which is the degree of vividness of a hue. Also known as Munsell chroma. 2. See color saturation. {krō'mə}

chroma band-pass amplifier See burst amplifier. {krō'mə 'band ,pas 'am-plī-fī-ər}

chroma control [ELECTR] The control that adjusts the amplitude of the carrier chrominance signal fed to the chrominance demodulators in a color television receiver, so as to change the saturation or vividness of the hues in the color picture. Also known as color control; color-saturation control. {krō'mə kən'trōl}

chromadizing [MET] Treating the surface of aluminum or aluminum alloys with chromic acid to improve paint adhesion. {krō'mə,dī-zīŋ}

Chromadioria [INV ZOO] A subclass of nematode worms in the class Adenophorea. {krō'mə'dōr-ē-ə}

Chromadorida [INV ZOO] An order of principally aquatic nematode worms in the subclass Chromadioria. {krō'mə'dōr-ē-də}

Chromadoridae [INV ZOO] A family of soil and fresh-water, free-living nematodes in the superfamily Chromadoroidea; generally associated with algal substances. {krō'mə'dōr-ē,dē}

Chromadoroidea [INV ZOO] A superfamily of small to moderate-sized, free-living nematodes with spiral, transversely ellipsoidal amphids and a striated cuticle. {krō'mə'də'rōid-ē-ə}

chromaffin [BIOL] Staining with chromium salts. {krō'mə-fən}

chromaffin body See paraganglion. {krō'mə-fən ,bād-ē}

chromaffin cell [HISTOL] Any cell of the suprarenal organs in lower vertebrates, of the adrenal medulla in mammals, of the paraganglia, or of the carotid bodies that stains with chromium salts. {krō'mə-fən ,sel}

chromaffin system [PHYSIO] The endocrine organs and tissues of the body that secrete epinephrine; characterized by an affinity for chromium salts. {krō'mə-fən ,sist-əm}

chroma oscillator [ELECTR] A crystal oscillator used in color television receivers to generate a 3.579545-megahertz signal for comparison with the incoming 3.579545-megahertz chrominance subcarrier signal being transmitted. Also known as chrominance-subcarrier oscillator; color oscillator; color-subcarrier oscillator. {krō'mə 'ās-ə,lād-ər}

chromascope [OPTICS] An instrument used to determine the optical effects of color. {krō'mə ,skōp}

chromate [INORG CHEM] CrO_4^{2-} 1. An ion derived from the unstable acid H_2CrO_4 . 2. A salt or ester of chromic acid. [MINERAL] A mineral characterized by the cation CrO_4^{2-} . {krō,māt}

chromate treatment [MET] Treatment of metal with a solution of a hexavalent chromium compound to produce a protective coating of metal chromate. {krō,māt ,trēt-mənt}

Chromatiaceae [MICROBIO] A family of bacteria in the suborder Rhodospirillineae; motile cells have polar flagella, pho-

tosynthetic membranes are continuous with the cytoplasmic membrane, all except one species are anaerobic, and bacteriochlorophyll *a* or *b* is present. {krō-mad-ē'as-ē-ē}

chromatic [OPTICS] Relating to color. {krō'mad-ik}

chromatic aberration [ELECTR] An electron-gun defect causing enlargement and blurring of the spot on the screen of a cathode-ray tube, because electrons leave the cathode with different initial velocities and are deflected differently by the electron lenses and deflection coils. [OPTICS] An optical lens defect causing color fringes, because the lens material brings different colors of light to focus at different points. Also known as color aberration. {krō'mad-ik ab-ə'rā-shən}

chromatic diagram See chromaticity diagram. {krō'mad-ik 'dī-ə,gram}

chromaticity [OPTICS] The color quality of light that can be defined by its chromaticity coordinates; depends only on hue and saturation of a color, and not on its luminance (brightness). {krō'mə'tis-əd-ē}

chromaticity coordinates [OPTICS] The fractional amounts of the *x*, *y*, and *z* primary colors, specified by the International Committee on Illumination, in a color sample; more precisely, $x = X / (X + Y + Z)$, $y = Y / (X + Y + Z)$, $z = Z / (X + Y + Z)$, where *X*, *Y*, and *Z* are the integrals over wavelength λ of the product of the amount of light emerging from the sample per unit wavelength, and the tristimulus values, $\bar{x}(\lambda)$, $\bar{y}(\lambda)$, and $\bar{z}(\lambda)$ respectively. {krō'mə'tis-əd-ē kō'örd-ən-āts}

chromaticity diagram [OPTICS] A triangular graph for specifying colors, whose ordinate is the *y* chromaticity coordinate and whose abscissa is the *x* chromaticity coordinate; the apexes of the triangle represent primary colors. Also known as chromatic diagram. {krō'mə'tis-əd-ē dī-ə,gram}

chromatic mineral [MINERAL] A mineral with color. {krō'mad-ik ,mīn-rəl}

chromatic number [MATH] For a specified surface, the smallest number *n* such that for any decomposition of the surface into regions the regions can be colored with *n* colors in such a way that no two adjacent regions have the same color. {krō'mad-ik 'nəm-bər}

chromatic parallax [OPTICS] A type of optical parallax that arises from the dependence of the position of the focal plane on the wavelength of light. {krō'mad-ik 'par-ə,laks}

chromatic resolving power [OPTICS] The difference between two equally strong spectral lines that can barely be separated by a spectroscopic instrument, divided into the average wavelength of these two lines; for prisms and gratings Rayleigh's criteria are used, and the term is defined as the width of the emergent beam times the angular dispersion. {krō'mad-ik rə'zālv-īŋ ,pau-ər}

chromatics [OPTICS] 1. The branch of optics concerned with the properties of colors. 2. The part of colorimetry concerned with hue and saturation. {krō'mad-iks}

chromatic sensitivity [OPTICS] The smallest change in wavelength of light that produces a change in hue which is just large enough to be detected by human vision. {krō'mad-ik sen-sə'tiv-əd-ē}

chromatic vision [PHYSIO] Vision pertaining to the color sense, that is, the perception and evaluation of the colors of the spectrum. {krō'mad-ik 'vizh-ən}

chromatid [CYTOL] 1. One of the pair of strands formed by longitudinal splitting of a chromosome which are joined by a single centromere in somatic cells during mitosis. 2. One of a tetrad of strands formed by longitudinal splitting of paired chromosomes during diplotene of meiosis. {krō'mat-əd}

chromatin [BIOCHEM] The deoxyribonucleoprotein complex forming the major portion of the nuclear material and of the chromosomes. {krō'mə-tən}

chromating [MET] Performing a chromate treatment. {krō,mād-īŋ}

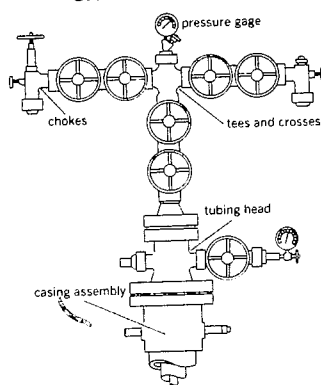
Chromatium [MICROBIO] A genus of bacteria in the family Chromatiaceae; cells are ovoid to rod-shaped, are motile, do not have gas vacuoles, and contain bacteriochlorophyll *a* on vesicular photosynthetic membranes. {krō'māsh-ē-əm}

chromatogram [ANALY CHEM] The pattern formed by zones of separated pigments and of colorless substance in chromatographic procedures. {krō'mad-ə,gram}

chromatograph [ANALY CHEM] To employ chromatography to separate substances. {krō'mad-ə,graf}

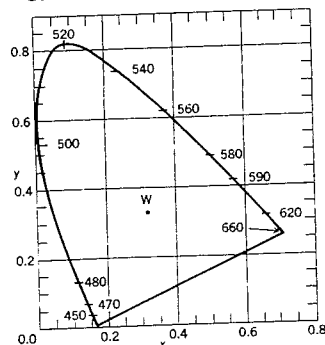
chromatographic adsorption [ANALY CHEM] Preferential adsorption of chemical compounds (gases or liquids) in an

CHRISTMAS TREE



Typical layout of a Christmas tree.

CHROMATICITY DIAGRAM



International Committee on Illumination chromaticity diagram. The wavelengths of the visible spectrum in units of 10^{-9} meter are indicated along the curve. W represents a white composed of equal amounts of the three primaries. (Adapted from A. C. Hardy, ed., *Handbook of Colorimetry*, copyright 1936 by The MIT Press)

chromium-51 [NUC PHYS] A radioactive isotope with atomic mass 51 made by neutron bombardment of chromium; radiates gamma rays. { 'krō-mē-əm, fift'wən }

chromium carbide [INORG CHEM] Cr_3C_2 Orthorhombic crystals with a melting point of 1890°C; resistant to oxidation, acids, and alkalis; used for hot-extrusion dies, in spray-coating materials, and as a component for pumps and valves. { 'krō-mē-əm 'kär,bid }

chromium chloride [INORG CHEM] A group of compounds of chromium and chloride; chromium may be in the +2, +3, or +6 oxidation state. { 'krō-mē-əm 'klōr,īd }

chromium coating See chrome plating. { 'krō-mē-əm 'kōd-īŋ }

chromium dioxide [INORG CHEM] Cr_2O_3 Black, acicular crystals; a semiconducting material with strong magnetic properties used in recording tapes. { 'krō-mē-əm dī'āk,sīd }

chromium dioxide tape [ELECTR] A magnetic recording tape developed primarily to improve quality and brilliance of reproduction when used in cassettes operated at 1 7/8 inches per second (4.76 centimeters per second); requires special recorders that provide high bias. { 'krō-mē-əm dī'āk,sīd 'tāp }

chromium-gold metallizing [ELECTR] A metal film used on a silicon or silicon oxide surface in semiconductor devices because it is not susceptible to purple plague deterioration; a layer of chromium is applied first for adherence to silicon, then a layer of chromium-gold mixture, and finally a layer of gold to which bonding contacts can be applied. { 'krō-mē-əm 'gōld 'med-əl-īz-īŋ }

chromium-iron alloy [MET] Any of several acid- and corrosion-resistant alloys containing chromium and iron. { 'krō-mē-əm 'T-ərn 'al,oi }

chromium molybdenum steel [MET] Cast steel containing up to 1% carbon, 0.7–1.1% chromium, and 0.2–0.4% molybdenum; characterized by high strength and ductility. { 'krō-mē-əm mō'lib-də-nəm 'stēl }

chromium-nickel alloy [MET] Any of several alloys containing chromium and nickel in various proportions together with small amounts of other metals. { 'krō-mē-əm 'nik-əl 'al,oi }

chromium oxide [INORG CHEM] A compound of chromium and oxygen; chromium may be in the +2, +3, or +6 oxidation state. { 'krō-mē-əm 'āk,sīd }

chromium oxychloride See chromyl chloride. { 'krō-mē-əm āk-sē'klōr,īd }

chromium plating See chrome plating. { 'krō-mē-əm 'plād-īŋ }

chromium stearate [ORG CHEM] $\text{Cr}(\text{C}_{18}\text{H}_{35}\text{O}_2)_3$ A dark-green powder, melting at 95–100°C; used in greases, ceramics, and plastics. { 'krō-mē-əm 'stīr,āt }

chromium steel [MET] Hard, wear-resistant steel containing chromium as the predominating alloying element. Also known as chrome steel. { 'krō-mē-əm 'stēl }

chromium-vanadium steel [MET] Any of several strong, hard alloy steels containing 0.15–0.25% vanadium, 0.50–1% chromium, and 0.45–0.55% carbon. Also known as chrome-vanadium steel. { 'krō-mē-əm vā'nād-ē-əm 'stēl }

chromizing [MET] Surface-alloying of metals in which an alloy is formed by diffusion of chromium into the base metal. { 'krō,mīz-īŋ }

Chromobacterium [MICROBIO] A genus of gram-negative, aerobic or facultatively anaerobic, motile, rod-shaped bacteria of uncertain affiliation; they produce violet colonies and violacein, a violet pigment with antibiotic properties. { 'krō-mō,bak'tīr-ē-əm }

chromoblastomycosis [MED] A granulomatous skin disease caused by any of several fungi, usually *Hormodendrum pedrosoi*, and characterized by warty nodules which may ulcerate. Also known as chromomycosis. { 'krō-mō'blas-tō-mī'kō-səs }

chromocenter [CYTOL] An irregular, densely staining mass of heterochromatin in the chromosomes, with six armlike extensions of euchromatin, in the salivary glands of *Drosophila*. { 'krō-mō,sen-tər }

chromocratic See melanocratic. { 'krō-mə'krad-ik }

chromocyte [HISTOL] A pigmented cell. { 'krō-mə,sīt }

chromodynamics [PARTIC PHYS] A theory of the interaction between quarks carrying color in which the quarks exchange gluons in a manner analogous to the exchange of photons

between charged particles in electrodynamics. { 'krō-mō-dī'nam-iks }

chromogen [BIOCHEM] A pigment precursor. [MICROBIO] A microorganism capable of producing color under suitable conditions. { 'krō-mə,jen }

chromogenesis [BIOCHEM] Production of colored substances as a result of metabolic activity; characteristic of certain bacteria and fungi. { 'krō-mō'jen-əs-səs }

chromolipid See lipochrome. { 'krō-mō'lip-īd }

chromolithography [GRAPHICS] Lithographic printing with several colors, requiring a stone for each color. { 'krō-mō-li'thäg-rə-fē }

chromomere [CYTOL] Any of the linearly arranged chromatin granules in leptotene and pachytene chromosomes and in polytene nuclei. { 'krō-mō,mīr }

chromometer See colorimeter. { 'krə'mäm-əd-ər }

chromomycin [MICROBIO] Any of five components of an antibiotic complex produced by a strain of *Streptomyces griseus*; components are designated A₁ to A₅, of which A₅ ($\text{C}_{51}\text{H}_{72}\text{O}_{32}$) is biologically active. { 'krō-mō'mī-sən }

chromomycosis See chromoblastomycosis. { 'krō-mō'mī'kō-səs }

chromonema [CYTOL] The coiled core of a chromatid; it is thought to contain the genes. { 'krō-mō'nē-mə }

chromoneme [GEN] The genetic material of a bacterium or virus, as distinguished from true chromosomes in plant or animal cells. { 'krō-mə,nēm }

chromophile [BIOL] Staining readily. { 'krō-mō,fīl }

chromophobe [BIOL] Not readily absorbing a stain. { 'krō-mə,fōb }

chromophore [CHEM] An arrangement of atoms that gives rise to color in many organic substances. { 'krō-mə,för }

Chromophycota [BOT] A division of the plant kingdom comprising nine classes of algae ranging in size and complexity from unicellular flagellates to gigantic kelps; distinguished by the presence (in almost all) of chlorophyll *c* to complement chlorophyll *a*, and usually having brownish or yellowish chloroplasts. Also known as Chromophyta. { 'krō-mō'fīk-əd-ə }

chromophyll [BIOCHEM] Any plant pigment. { 'krō-mə,fīl }

Chromophyta See Chromophycota. { 'krō'mäf-əd-ə }

chromoplasm [BOT] The pigmented, peripheral protoplasm of blue-green algae cells; contains chlorophyll, carotenoids, and phycobilins. { 'krō-mō,plaz-əm }

chromoplast [CYTOL] Any colored cell plastid, excluding chloroplasts. { 'krō-mō,plast }

chromoprotein [BIOCHEM] Any protein, such as hemoglobin, with a metal-containing pigment. { 'krō-mō'prō,tēn }

chromoradiometer [ENG] A radiation meter that uses a substance whose color changes with x-ray dosage. { 'krō-mō-rād-ē'ām-əd-ər }

chromoscope [OPTICS] An instrument for analyzing color values and intensities. { 'krō-mə,skōp }

chromosomal hybrid sterility [GEN] Sterility caused by inability of homologous chromosomes to pair during meiosis due to a chromosome aberration. { 'krō-mə'sō-məl 'hī-brad stē-nīl-əd-ē }

chromosome [CYTOL] Any of the complex, threadlike structures seen in animal and plant nuclei during karyokinesis which carry the linearly arranged genetic units. { 'krō-mə,sōm }

chromosome aberration [GEN] Modification of the normal chromosome complement due to deletion, duplication, or rearrangement of genetic material. { 'krō-mə,sōm ə-brə'rā-shən }

chromosome complement [GEN] The species-specific, normal diploid set of chromosomes in somatic cells. { 'krō-mə,sōm 'käm-plə,mənt }

chromosome map See genetic map. { 'krō-mə,sōm'map }

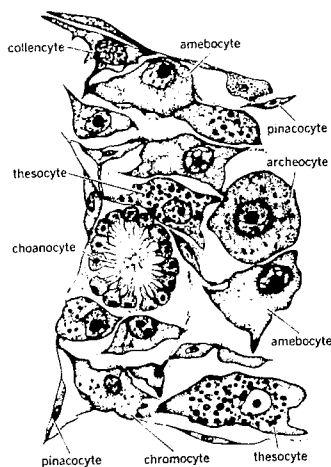
chromosome puff [CYTOL] Chromatic material accumulating at a restricted site on a chromosome; thought to reflect functional activity of the gene at that site during differentiation. { 'krō-mə,sōm,paf }

chromosome walking [GEN] Sequential isolation of overlapping molecular clones in order to span large intervals on the chromosome. { 'krō-mə,sōm,wōk-īŋ }

chromosphere [ASTRON] A transparent, tenuous layer of gas that rests on the photosphere in the atmosphere of the sun. { 'krō-mə,sfir }

chromospheric network [ASTRON] A large-scale cellular pattern into which the motion of gas in the chromosphere is ordered by magnetic folds, and which is visible in spectra-

CHROMOCYTE



Cell types found in a fresh-water sponge as seen in a cross section through the interior of the sponge. Note chromocyte at bottom of tissue.

low-voltage winding

becomes active; used to activate bugging equipment. { 'lō
vōltij 'rē,lā }

low-voltage winding [ELECTROMAG] The coil of wire wound
around the core of a power transformer which has the smaller
number of turns, and therefore the lower voltage. { 'lō 'vōl-
tīj 'wind-ij }

low water [OCEANOGR] The lowest limit of the surface water
level reached by the lowering tide. Also known as low tide.
{ 'lō 'wōd-ər }

low-water fuel cutoff [MECH ENG] A float device which
shuts off fuel supply and burner when boiler water level drops
below the lowest safe waterline. { 'lō 'wōd-ər 'fjūl 'kə,dōf }

low-water inequality [OCEANOGR] The difference between
the heights of two successive low tides. { 'lō 'wōd-ər 'in-
'kwāl-əd-ē }

low-water interval See low-water lunital interval. { 'lō
'wōd-ər 'int-ər-vəl }

low-water lunital interval [GEOPHYS] For a specific lo-
cation, the interval of time between the transit (upper or lower)
of the moon and the next low water. Also known as low-water
interval. { 'lō 'wōd-ər 'lūn-ə'tid-əl 'int-ər-vəl }

low-water neaps See mean low-water neaps. { 'lō 'wōd-ər
'neps }

low-water springs See mean low-water springs. { 'lō 'wōd-
'ər 'sprinz }

LOX See liquid-oxygen explosive. { 'lāks }

loxodont [VERT ZOO] Having molar teeth with shallow hol-
lows between the ridges. { 'lāk-sə,dānt }

loxodrome See rhumb line. { 'lāk-sə,drōm }

loxodromic spiral [MATH] A curve on a surface of revolu-
tion which cuts the meridians at a constant angle other than
90°. { 'lāk-sə'drām-ik 'spī-rəl }

loxolophodont [VERT ZOO] Having crests on the molar teeth
that connect three of the tubercles and with the fourth or pos-
terior inner tubercle being rudimentary or absent. { 'lāk-sə'lāf-
əd,dānt }

Loxonematacea [PALEON] An extinct superfamily of gas-
tropod mollusks in the order Prosobranchia. { 'lāk-sə,ne-
mə'tās-ē-ə }

lozenge file [DES ENG] A small file with four sides and a
lozenge-shaped cross section; used in forming dies. { 'lāz-ənj
'fil }

L pad [ENG ACOUS] A volume control having essentially the
same impedance at all settings. { 'el 'pad }

LPE See liquid-phase epitaxy.

LPF process [MIN ENG] Recovery of metals from tailings
by a sequence of leaching, precipitation, and flotation.
{ 'el,pē'ef 'prās-səs }

LPG See liquefied petroleum gas.

LPM See lines per minute.

LP record See long-playing record. { 'el,pē 'rek-ərd }

L-process [NUC PHYS] The synthesis of certain light nuclides
through the breakup of heavier nuclides, probably by cosmic-
ray bombardment of the interstellar medium. { 'l 'prās-səs }

LPTV station See low-power television station. { 'el,pē'tē've
'stā-shən }

Lr See lawrencium.

LRC See longitudinal redundancy check.

LRRP See lowest required radiating power.

LSA diode [ELECTR] A microwave diode in which a space
charge is developed in the semiconductor by the applied electric
field and is dissipated during each cycle before it builds up
appreciably, thereby limiting transit time and increasing the
maximum frequency of oscillation. Derived from limited
space-charge accumulation diode. { 'el'es'ā 'di,ōd }

LSB See least significant bit.

L scan See L scope. { 'el 'skan }

L scope [ELECTR] A cathode-ray scope on which a trace
appears as a vertical or horizontal range scale, the signals
appearing as left and right horizontal (or up and down vertical)
deflections as echoes are received by two antennas, the left and
right (or up and down) deflections being proportional to the
strength of the echoes received by the two antennas. Also
known as L indicator; L scan. { 'el 'sköp }

LS coupling See Russell-Saunders coupling. { 'el'es 'kəp-
līj }

LSD See dock landing ship; lysergic acid diethylamide.

LSD-25 See lysergic acid diethylamide.

L shell [ATOM PHYS] The second shell of electrons surround-

ing the nucleus of an atom, having electrons whose principal
quantum number is 2. { 'el 'shel }

LSI circuit See large-scale integrated circuit. { 'el'es'i 'sər
kət }

L-1 test [ENG] A 480-hour engine test in a single-cylinder
Caterpillar diesel engine to determine the detergency of heavy-
duty lubricating oils. { 'el 'wən 'test }

L-2 test [ENG] An engine test made in a single-cylinder
Caterpillar diesel engine to determine the oiliness of an engine
oil. Also known as scoring test. { 'el 'tū 'test }

L-3 test [ENG] An engine test in a four-cylinder Caterpillar
engine to determine stability of crankcase oil at high tempera-
tures and under severe operating conditions. { 'el 'thrē 'test }

L-4 test [ENG] An engine test in a six-cylinder spark-ignition
Chevrolet engine to evaluate crankcase oil oxidation stability,
bearing corrosion, and engine deposits. { 'el 'fōr 'test }

L-5 test [ENG] An engine test in a General Motors diesel
engine to determine detergency, corrosiveness, ring sticking,
and oxidation stability properties of lubricating oils. { 'el 'fiv
'test }

LTPD See lot tolerance percent defective.

LTRS See letters shift.

Lu See lutetium.

lub See least upper bound.

lubber line See lubber's line. { 'ləb-ər 'līn }

lubber's line [NAV] A reference line on any direction-indi-
cating instrument, marking the reading which coincides with
the heading. Also known as lubber line; lubber's point.
{ 'ləb-ərz 'līn }

lubber's line error [NAV] In a magnetic compass, the an-
gular difference between the heading as indicated by a lubber's
line, and the actual heading; this error is caused by faulty
calibration. { 'ləb-ərz 'līn 'er-ər }

lubber's point See lubber's line. { 'ləb-ərz 'pōint }

lube cut [MATER] The distilled fraction of crude oil with
suitable boiling range and viscosity to yield a lubricating oil
when it is completely refined. Also known as lube-oil distil-
late; lube stock. { 'lūb 'kət }

lube oil See lubricating oil. { 'lūb 'ōil }

lube-oil distillate See lube cut. { 'lūb 'ōil 'dis-tā,lāt }

lube stock See lube cut. { 'lūb 'stāk }

lubricant [MATER] A substance used to reduce friction be-
tween parts or objects in relative motion. { 'lū-brə-kənt }

lubricant additive [MATER] Any material added to lubri-
cants (greases or oils) to give the product special properties,
such as resistance to extremes of pressure, cold, or heat, im-
proved viscosity, and detergency. { 'lū-brə-kənt 'əd-əd-iv }

lubricated gasoline [MATER] A motor gasoline into which
a lubricant has been added. { 'lū-brə,kād-əd 'gas-ə,lēn }

lubricating film [MATER] A thin layer of oil or grease applied
between rubbing surfaces. { 'lū-brə,kād-ij 'fīlm }

lubricating grease [MATER] A solid or semisolid lubricant
consisting of a thickening agent (soap or other additives) in a
fluid lubricant (usually petroleum lubricating oil). { 'lū-
brə,kād-ij 'grēs }

lubricating oil [MATER] Selected fractions of refined petro-
leum or other oils (with or without additives) used to lessen
friction between moving surfaces. Also known as lube oil.
{ 'lū-brə,kād-ij 'ōil }

lubrication action [MATER] The ability of the lubricant to
maintain a fluid film between solid surfaces and to prevent their
physical contact. { 'lū-brə'kā-shən 'ak-shən }

lubricator [ENG] A device for applying a lubricant. { 'lū-
brə,kād-ər }

lubricity [MATER] The ability of a material to lubricate.
{ 'lū'bris-əd-ē }

Lucanidae [INV ZOO] The stag beetles, a cosmopolitan fam-
ily of coleopteran insects in the superfamily Scarabaeoidea.
{ 'lū'kan-ə,dē }

lucca oil See olive oil. { 'lū-kə 'ōil }

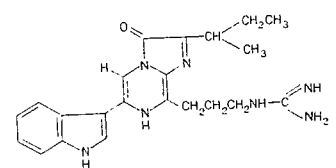
lucerne See alfalfa. { 'lū'sərn }

Lucibacterium [MICROBIO] A genus of light-emitting bac-
teria in the family Vibrionaceae; motile, asporogenous rods
with peritrichous flagella. { 'lū-si,bak'tir-ē-əm }

luciferase [BIOCHEM] An enzyme that catalyzes the oxida-
tion of luciferin. { 'lū'sif-ə-rās }

luciferin [BIOCHEM] A species-specific pigment in many lu-
minous organisms that emits heatless light when combined with
oxygen. { 'lū'sif-ər-ən }

LUCIFERIN

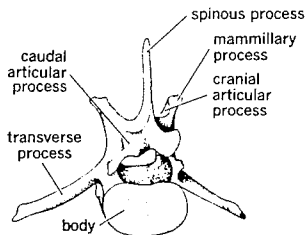


Structural formula of *Cypridina* luciferin.

LUCKIESH-MOSS
VISIBILITY METER

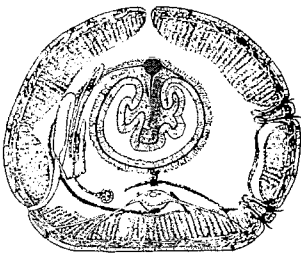
Photograph of Luckiesh-Moss visibility meter. (General Electric Co.)

LUMBAR VERTEBRAE



Fifth lumbar vertebra of the dog, the caudal lateral aspect showing the body or centrum. (From M. E. Miller, G. C. Christensen, and H. E. Evans, *Anatomy of the Dog*, Saunders, 1964)

LUMBRICUS



Cross section of the earthworm (*Lumbricus terrestris*). (From T. I. Storer, *General Zoology*, 3d ed., McGraw-Hill, 1957)

Luciocephalidae [VERT ZOO] A family of fresh-water fishes in the suborder Anabantoidae. { 'lū-sē-ō-sā'fā-lā-dē }

Luckiesh-Moss visibility meter [ENG] A type of photometer that consists of two variable-density filters (one for each eye) that are adjusted so that an object seen through them is just barely discernible; the reduction in visibility produced by the filters is read on a scale of relative visibility related to a standard task. { lū'kēsh 'mōs, viz-ə-bil-əd-ē, mēd-ər }

Lüders' lines [MET] Surface markings on a metal caused by flow of the material strained beyond its elastic limit. Also known as deformation bands; Hartmann lines; Lüders' bands; Piobert lines; stretcher strains. { 'lūd-ərz, līnz }

Ludian [GEOL] A European stage of geologic time in the uppermost Eocene, above the Bartonian and below the Tortonian of the Oligocene. { 'lūd-ē-ən }

ludlamite [MINERAL] $(\text{Fe}, \text{Mg}, \text{Mn})_3(\text{PO}_4)_2 \cdot 4\text{H}_2\text{O}$ A green mineral crystallizing in the monoclinic system and occurring in small, transparent crystals. { 'lād-lā,mīt }

Ludlovian [GEOL] A European stage of geologic time; Upper Silurian, below Gedinian of Devonian, above Wenlockian. { 'lād'lō-vē-ən }

ludwigite [MINERAL] $(\text{Mg}, \text{Fe})_2\text{FeBO}_3$ Blackish-green mineral that crystallizes in the monoclinic system and occurs in fibrous masses; isomorphous with rosenite. { 'lād,wī,gīt }

Ludwig's angina [MED] Acute streptococcal cellulitis of the floor of the mouth. { 'lād,wīgz 'an-jə-nā }

Luenberger observer [CONT SYS] A compensator driven by both the inputs and measurable outputs of a control system. { 'lūn,bərg-ər əb'zər-vər }

lueneburgite [MINERAL] $\text{Mg}_3\text{B}_2(\text{OH})_6(\text{PO}_4)_2 \cdot 6\text{H}_2\text{O}$ A colorless mineral composed of hydrous basic phosphate of magnesium and boron. { 'lū-nə-bərg,gīt }

lueshite [MINERAL] NaNbO_3 An orthorhombic mineral having perovskite-type structure; it is dimorphous with natroniobite. { 'lū-əs,hīt }

lug [DES ENG] A projection or head on a metal part to serve as a cap, handle, support, or fitting connection. { ləg }

lugarot [METEOROL] A strong south or south-southeast wind of Lake Garda, Italy. { lū'gā,nōt }

lug bolt [DES ENG] 1. A bolt with a flat extension or hook instead of a head. 2. A bolt designed for securing a lug. { 'lāg,bōlt }

lug brick [MATER] A brick with lugs for spacing adjacent bricks. { 'lāg,brik }

Luggin probe [PHYS CHEM] A device which transmits a significant current density on the surface of an electrode to measure its potential. { 'lāg-ən,prōb }

Lugol solution [CHEM] A solution of 5 grams of iodine and 10 grams of potassium iodide per 100 milliliters of water; used in medicine. { 'lū,gōl sō'lū-shən }

LUHF See lowest useful high frequency.

Luidiidae [INV ZOO] A family of echinoderms in the suborder Paxillosina. { lū-ə'dī-ə,dē }

Luisian [GEOL] A North American stage of geologic time: Miocene (above Relizian, below Mohnian). { lū-ē-shən }

Lukasiewicz notation See Polish notation. { lū,kā-shē'ā,vits nō,lā-shən }

lum See trolley. { ləm }

lumbago [MED] Backache in the lumbar or lumbosacral region. { ,ləm'bā,gō }

lumbang oil [MATER] Colorless or yellow liquid with pleasant aroma and bland taste; soluble in alcohol, ether, chloroform, and carbon disulfide; expressed from candlenut; used as an illuminant and wood preservative, and in paints, calking, and soap manufacture. Also known as candlenut oil. { lūm'bāŋ ,ōil }

lumbar artery [ANAT] Any of the four or five pairs of branches of the abdominal aorta opposite the lumbar region of the spine: supplies blood to loin muscles, skin on the sides of the abdomen, and the spinal cord. { ,ləm,bār 'ārd-ə-rē }

lumbar nerve [ANAT] Any of five pairs of nerves arising from lumbar segments of the spinal cord; characterized by motor, visceral sensory, somatic sensory, and sympathetic components; they innervate the skin and deep muscles of the lower back and the lumbar plexus. { ,ləm,bār 'nərv }

lumbar vertebrae [ANAT] Those vertebrae located between the lowest ribs and the pelvic girdle in all vertebrates. { ,ləm,bār 'vərd-ə-brā }

lumber [MATER] Logs that have been sawed and prepared for market. { 'ləm-bər }

lumberg [OPTICS] A unit of luminous energy equal to the luminous energy corresponding to a radiant energy of $1/K$ ergs, where K is the luminous efficiency in lumens per watt. Formerly known as lumerg. { 'lūm,bərg }

lumbodorsal fascia [ANAT] The sheath of the erector spinae muscle alone, or the sheaths of the erector spinae and the quadratus lumborum muscles. { ,ləm'bō'dōr-səl 'fā-shā }

lumbosacral plexus [ANAT] A network formed by the anterior branches of lumbar, sacral, and coccygeal nerves which for descriptive purposes are divided into the lumbar, sacral, and pudendal plexuses. { ,ləm'bō'sak-rəl 'plek-səs }

Lumbricidae [INV ZOO] A family of annelid worms in the order Oligochaeta; includes the earthworm. { ləm'brī-sā,dē }

Lumbriclymeninae [INV ZOO] A subfamily of mud-swallowing sedentary worms in the family Maldanidae. { ,ləm'brī-klī'men-ə,nē }

Lumbriculidae [INV ZOO] A family of aquatic annelids in the order Oligochaeta. { ,ləm'brī'kyū-lā,dē }

Lumbricus [INV ZOO] A genus of earthworms recognized as the type genus of the family Lumbricidae. { 'ləm-brā-kas }

Lumbrineridae [INV ZOO] A family of errant polychaetes in the superfamily Eunicia. { ,ləm'brī'ner-ə,dē }

lumen [ANAT] The interior space within a tubular structure, such as within a blood vessel, a duct, or the intestine. [OPTICS] The unit of luminous flux, equal to the luminous flux emitted within a unit solid angle (1 steradian) from a point source having a uniform intensity of 1 candela, or to the luminous flux received on a unit surface, all points of which are at a unit distance from such a source. Symbolized lm. [SCI TECH] The space within a tube. { 'lū-mən }

lumen-hour [OPTICS] A unit of quantity of light (luminous energy), equal to the quantity of light radiated or received for a period of 1 hour by a flux of 1 lumen. Abbreviated lm-hr. { 'lū-mən 'aūr }

lumen per watt [OPTICS] The unit of luminosity factor and of luminous efficacy. Abbreviated lm/w. { 'lū-mən pər 'wāt }

lumen-second [OPTICS] A unit of quantity of light (luminous energy), equal to the quantity of light radiated or received for a period of 1 second by a flux of 1 lumen. Abbreviated lm-sec. { 'lū-mən 'sek-ənd }

lumerg See lumberg. { 'lū,mərg }

luminaire [ELEC] An electric lighting fixture, wall bracket, portable lamp, or other complete lighting unit designed to contain one or more electric lighting sources and associated reflectors, refractors, housing, and such support for those items as necessary. { 'lū-mā-ner }

luminance [OPTICS] The ratio of the luminous intensity in a given direction of an infinitesimal element of a surface containing the point under consideration, to the orthogonally projected area of the element on a plane perpendicular to the given direction. Formerly known as brightness. { 'lū-mā-nəns }

luminance carrier See picture carrier. { 'lū-mā-nəns ,kār-ər }

luminance channel [COMMUN] A path intended primarily for the luminance signal in a color television system. { 'lū-mā-nəns ,chan-əl }

luminance factor [OPTICS] The ratio of the luminance of a body when illuminated and observed under certain conditions to that of a perfect diffuser under the same conditions. { 'lū-mā-nəns ,fak-tər }

luminance primary [COMMUN] One of the three transmission primaries whose amount determines the luminance of a color in a color television system. { 'lū-mā-nəns 'pri,merē }

luminance signal [COMMUN] The color television signal that is intended to have exclusive control of the luminance of the picture. Also known as Y signal. { 'lū-mā-nəns ,sīgnəl }

luminescence [PHYS] Light emission that cannot be attributed merely to the temperature of the emitting body, but results from such causes as chemical reactions at ordinary temperatures, electron bombardment, electromagnetic radiation, and electric fields. { ,lū-mā'nes-əns }

luminescent [PHYS] Capable of exhibiting luminescence. { ,lū-mā'nes-ənt }

luminescent cell See electroluminescent panel. { ,lū-mā'nes-ənt 'sel }

luminescent center [SOLID STATE] A point-lattice defect in

luminescent dye

a transparent crystal that exhibits luminescence. { 'lū-mə'nes-ənt 'sen-tər }

luminescent dye [MATER] A dye that is made luminous by excitation with an outside energy source; used in luminous paint. { 'lū-mə'nes-ənt 'dī }

luminescent screen [ELECTR] The screen in a cathode-ray tube, which becomes luminous when bombarded by an electron beam and maintains its luminosity for an appreciable time. { 'lū-mə'nes-ənt 'skrēn }

luminol [ORG CHEM] $C_8H_7N_3O_2$ A white, water-soluble, crystalline compound that melts at $320^\circ C$; used in an alkaline solution for analytical testing in chemistry. Also known as 3-aminophthalic acid cyclic hydrazide. { 'lū-mə'nōl }

luminescent material [PHYS] A luminescent material that converts part of the absorbed primary energy into emitted luminescent radiation. Also known as fluophor; fluor; phosphor. { 'lū'mī-nə'fər }

luminescence [NUCLEO] A measure of the performance of a colliding-beam system, equal to the reaction rate or number of interactions per second divided by the interaction cross section. { 'lū-mə'nās-əd-ē }

luminescence factor [OPTICS] See luminosity factor. { 'lū-mə'nās-əd-ē }

luminescence classes [ASTRON] A classification of stars in an orderly sequence according to their absolute brightness. { 'lū-mə'nās-əd-ē 'klas-əz }

luminescence curve See luminosity function. { 'lū-mə'nās-əd-ē 'kərv }

luminescence factor [OPTICS] The ratio of luminous flux in lumens emitted by a source at a particular wavelength to the corresponding radiant flux in watts at the same wavelength; thus this is a measure of the visual sensitivity of the eye. Also known as luminosity. { 'lū-mə'nās-əd-ē 'fak-tər }

luminescence function [ASTRON] The functional relationship between stellar magnitude and the number and distribution of stars of each magnitude interval. Also known as relative luminosity factor. { 'lū-mə'nās-əd-ē 'fəŋk-shən }

luminescence monitor [NUCLEO] A device, located on the inside of the detector of a colliding-beam accelerator near the two entering beams, that gives a signal proportional to the total number of collisions that occur at the interaction point. { 'lū-mə'nās-əd-ē 'mān-əd-ər }

luminescence cloud See sheet lightning. { 'lū-mə'nās 'klaūd }

luminescence coefficient [OPTICS] A measure of the fraction of the radiant power of a light source which contributes to its luminous properties, equal to the average of the luminosity function at various wavelengths, weighted according to the spectral intensity of the source. Also known as luminous efficiency. { 'lū-mə'nās 'kō-i'fish-ənt }

luminescence efficacy [OPTICS] 1. The ratio of the total luminous flux in lumens emitted by a light source over all wavelengths to the total radiant flux in watts. Formerly known as luminous efficiency. 2. The ratio of the total luminous flux emitted by a light source to the power input of the source; expressed in lumens per watt. { 'lū-mə'nās 'ef-ə-kəs-ē }

luminescence efficiency See luminous coefficient; luminous efficacy. { 'lū-mə'nās 'i'fish-ən-sē }

luminescence emittance [OPTICS] The emittance of visible radiation weighted to take into account the different response of the human eye to different wavelengths of light; in photometry, luminous emittance is always used as a property of a self-luminous source, and therefore should be distinguished from luminance. Also known as luminous exitance. { 'lū-mə'nās 'i'mit-əns }

luminescence energy [OPTICS] The total radiant energy emitted by a source, evaluated according to its capacity to produce visual sensation; measured in lumen-hours or lumen-seconds. { 'lū-mə'nās 'en-ər-jē }

luminescence exitance See luminous emittance. { 'lū-mə'nās 'ek-səd-əns }

luminescence flux [OPTICS] The time rate of flow of radiant energy, evaluated according to its capacity to produce visual sensations; measured in lumens. { 'lū-mə'nās 'fləks }

luminescence flux density See illuminance. { 'lū-mə'nās 'fləks 'den-səd-ē }

luminescence intensity [OPTICS] The luminous flux incident on a small surface which lies in a specified direction from a light

source and is normal to this direction, divided by the solid angle (in steradians) which the surface subtends at the source of light. Also known as light intensity. { 'lū-mə'nās 'in-tən-səd-ē }

luminous mass [ASTRON] The mass of a celestial object inferred from its luminosity or the luminosities of its components. { 'lū-mə'nās 'mas }

luminous meteor [METEOROL] According to United States weather observing practice, any one of a number of atmospheric phenomena which appear as luminous patterns in the sky, including halos, coronas, rainbows, aurorae, and their many variations, but excluding lightning (an igneous meteor or electrometeor). { 'lū-mə'nās 'mēd-ē-ər }

luminous nebula [ASTRON] A nebula made bright by radiation from stars in the vicinity. { 'lū-mə'nās 'neb-yə-lə }

luminous paint [MATER] A type of paint in which luminous pigments are used. { 'lū-mə'nās 'pānt }

luminous pigment [MATER] A pigment that absorbs light energy and radiates visible light when exposed to ultraviolet light; made of phosphors such as strontium, zinc, and cadmium sulfides. { 'lū-mə'nās 'pig-mənt }

luminous quantities [OPTICS] Physical quantities used in photometry, such as luminous intensity and luminance, which are based on the response of the human eye, and are thus weighted to take into account the difference in response at different wavelengths of light. { 'lū-mə'nās 'kwān-əd-ēz }

luminous range [NAV] The distance at which a marine light may be seen in clear weather, expressed in nautical miles. { 'lū-mə'nās 'rānj }

luminous sensitivity of phototube [ELECTR] Quotient of the anode current by the incident luminous flux. { 'lū-mə'nās 'sen-sə'tiv-əd-ē əv 'fōd-ō,tūb }

luminous time ratio [NAV] Of a navigational light, the ratio of the length of a flash to the period of rotation. { 'lū-mə'nās 'tīm 'rā-shō }

luminous visibility diagram [NAV] A diagram by which the luminous ranges, as given in light lists, may be adjusted to various conditions of visibility. { 'lū-mə'nās 'vī-zə'bīl-əd-ē 'dī-ə-gram }

Lummer-Brodhun sight box [OPTICS] A device, having a series of prisms, for viewing simultaneously the two sides of a white diffuse plaster screen illuminated by light sources whose luminous intensities are being compared. { 'lū-mər 'brōd'hūn 'sīt 'bāks }

Lummer-Gehrcke plate [OPTICS] An interferometer consisting of a glass or quartz plate with parallel surfaces and sizable thickness in which multiple reflections take place. { 'lū-mər 'ger-kə 'plāt }

lump coal [MIN ENG] Bituminous coal that passes through a 6-inch (15-centimeter) round mesh in initial screening. { 'lūmp 'kōl }

lumpectomy [MED] Surgical removal of a tumor in the breast along with a small amount of surrounding tissue. { 'lūmp'pek-tə-mē }

lumped constant [ELEC] A single constant that is electrically equivalent to the total of that type of distributed constant existing in a coil or circuit. Also known as lumped parameter. { 'lūmpt 'kān-stənt }

lumped-constant network [ELEC] An analytical tool in which distributed constants (inductance, capacitance, and resistance) are represented as hypothetical components. { 'lūmpt 'kān-stənt 'net,wərk }

lumped discontinuity [ELECTROMAG] An analytical tool in the study of microwave circuits in which the effective values of inductance, capacitance, and resistance representing a discontinuity in a waveguide are shown as discrete components of equivalent value. { 'lūmpt 'dis,kānt-ən'ū-əd-ē }

lumped element [ELECTROMAG] A section of a transmission line designed so that electric or magnetic energy is concentrated in it at specified frequencies, and inductance or capacitance may therefore be regarded as concentrated in it, rather than distributed over the length of the line. { 'lūmpt 'el-ə-mənt }

lumped impedance [ELECTROMAG] An impedance concentrated in a single component rather than distributed throughout the length of a transmission line. { 'lūmpt im'pēd-əns }

lumped parameter See lumped constant. { 'lūmpt pə'ram-əd-ər }

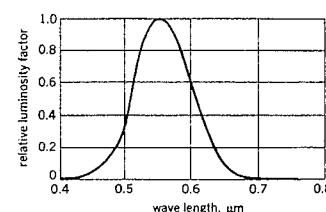
lumper [SYST] A taxonomist who tends to recognize large taxa. { 'lūm-pər }

lumpy jaw See actinomycosis. { 'lūmp-ē 'jō }

lumpy jaw

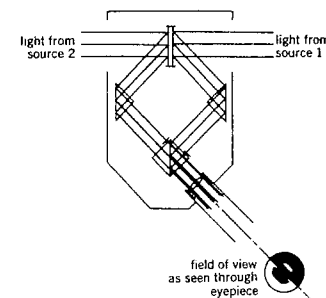
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LUMINOSITY FUNCTION



Human-eye luminosity function. (From W. B. Boast, *Illumination Engineering*, 2d ed., McGraw-Hill, 1953)

LUMMER-BRODHUN SIGHT BOX



Lummer-Brodhun contrast sight box.

Luna [ASTRON] A name for the moon. { 'lū-nā }

lunabase [ASTRON] The basic rocks that make up the dark portions of the lunar surface. Also known as marebase; marial rocks. { 'lū-nā,bās }

Luna program [AERO ENG] A series of Soviet space probes launched for flight missions to the moon. { 'lū-nā,prō-grām }

lunar appulse [ASTRON] An eclipse of the moon in which the penumbral shadow of the earth falls on the moon. Also known as penumbral eclipse. { 'lū-nār 'a,pəls }

lunar atmosphere [ASTROPHYS] The volatile elements postulated to have been present on the moon's surface at one time. { 'lū-nār 'at-mə,sfir }

lunar atmospheric tide [METEOROL] An atmospheric tide due to the gravitational attraction of the moon; the only detectable components are the 12-lunar-hour or semidiurnal component, as in the oceanic tides, and two others of very nearly the same period: the amplitude of this atmospheric tide is so small that it is detected only by careful statistical analysis of a long record. { 'lū-nār 'at-mə,sfir-ik 'tīd }

lunar caustic [MATER] A form of toughened silver nitrate consisting of 97-98% silver nitrate and 2-3% silver chloride. Also known as fused silver nitrate; molded silver nitrate. { 'lū-nār 'kōs-tik }

lunar crater [ASTRON] A crater on the moon's surface. { 'lū-nār 'krād-ər }

lunar crust [ASTRON] The outer layer of the moon. { 'lū-nār 'krəst }

lunar day [ASTRON] The time interval between two successive crossings of the meridian by the moon. { 'lū-nār 'dā }

lunar dust [ASTRON] Small particles adhering to the moon's surface. { 'lū-nār 'dəst }

lunar eclipse [ASTRON] Obscuration of the full moon when it passes through the shadow of the earth. { 'lū-nār 'i'klips }

lunar ephemeris [ASTRON] A computed list of positions the moon will occupy in the sky on certain dates. { 'lū-nār 'i'fem-ərəs }

lunar excursion module [AERO ENG] A manned spacecraft designed to be carried on top of the Apollo service module and having its own power plant for making a manned landing on the moon and a return from the moon to the orbiting Apollo spacecraft. Abbreviated LEM. Also known as lunar module (LM). { 'lū-nār 'ik'skər-zhən 'maj-ül }

lunar flight [AERO ENG] Flight by a spacecraft to the moon. { 'lū-nār 'flīt }

lunar geology See selenology. { 'lū-nār jē'äl-ə-jē }

lunar inequality [ASTRON] Variation in the moon's motion in its orbit, due to attraction by other bodies of the solar system. [GEOPHYS] A minute fluctuation of a magnetic needle from its mean position, caused by the moon. { 'lū-nār ,in-i'kwäl-əd-ē }

lunar interval [ASTRON] The difference in time between the transit of the moon over the Greenwich meridian and a local meridian; the lunar interval equals the difference between the Greenwich and local intervals of a tide or current phase. { 'lū-nār 'int-ər-vəl }

lunarite [ASTRON] The rocks that make up the bright portions of the lunar surface. { 'lū-nā,rīt }

lunar libration [ASTRON] 1. The effect wherein the face of the moon appears to swing east and west about 8° from its central position each month. Also known as apparent libration in longitude. 2. The state wherein the inclination of the moon's polar axis allows an observer on earth to see about 59% of the moon's surface. Also known as libration in latitude. 3. The small oscillation with which the moon rocks back and forth about its mean rotation rate. Also known as physical libration of the moon. { 'lū-nār lī'brā-shən }

lunar magnetic field [ASTROPHYS] The magnetic field of the moon. { 'lū-nār mag'ned-ik 'fēld }

lunar mass [ASTROPHYS] The mass of the moon. { 'lū-nār 'mas }

lunar meteoroid [ASTRON] A meteoric particle before it strikes the moon. { 'lū-nār 'mēd-ē-ə,rōid }

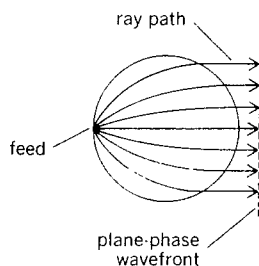
lunar module See lunar excursion module. { 'lū-nār 'maj-ül }

lunar month [ASTRON] The period of revolution of the moon about the earth, especially a synodical month. { 'lū-nār 'mənθ }

lunar mountain [ASTRON] A mountain on the moon. { 'lū-nār 'maunt-ən }

lunar node [ASTRON] A node of the moon's orbit. { 'lū-nār 'nōd }

LUNEBERG LENS



Luneberg lens with dielectric sphere between feed and plane-phase wavefront.

lunar nodule [ASTRON] A rock nodule found on the moon. { 'lū-nār 'nāj-ül }

lunar noon [ASTRON] The instant at which the sun is over the upper branch of any meridian of the moon. { 'lū-nār 'nūn }

lunar nutation [ASTRON] A nodding motion of the earth's axis caused by the inclination of the moon's orbit to the ecliptic; it can displace the celestial pole by 9 seconds of arc from its mean position and has a period of 18.6 years. { 'lū-nār nū'tā-shən }

lunar orbit [AERO ENG] Orbit of a spacecraft around the moon. { 'lū-nār 'örbət }

lunar polarization [ASTROPHYS] Polarization of light by the moon's surface. { 'lū-nār ,pō-lə-rə'zā-shən }

lunar pole [ASTRON] A pole of the moon. { 'lū-nār 'pōl }

lunar probe [AERO ENG] Any space probe launched for flight missions to the moon. { 'lū-nār 'prōb }

lunar rainbow See moonbow. { 'lū-nār 'rān,bō }

lunar rock [ASTRON] Rock found on the moon. { 'lū-nār 'rāk }

lunar satellite [AERO ENG] A satellite making one or more revolutions about the moon. { 'lū-nār 'sad-əl-īt }

lunar spacecraft [AERO ENG] A spacecraft designed for flight to the moon. { 'lū-nār 'spās,kraft }

lunar tide [OCEANOGR] The portion of a tide produced by forces of the moon. { 'lū-nār 'tīd }

lunar time [ASTRON] 1. Time based upon the rotation of the earth relative to the moon; it may be designated as local or Greenwich, as the local or Greenwich meridian is used as the reference. 2. Time on the moon. { 'lū-nār 'tim }

lunar topology [ASTRON] Topology of the moon. { 'lū-nār tō'päl-ə-jē }

lunar year [ASTRON] A time interval comprising 12 lunar (synodic) months. { 'lū-nār 'yir }

lunate [BIOL] Crescent-shaped { 'lū,nāt }

lunate bar [GEOL] A crescent-shaped bar of sand that is frequently found off the entrance to a harbor. { 'lū,nāt 'bär }

lunation [ASTRON] The time period between two successive new moons. { 'lū'nā-shən }

Lundegardh vaporizer [ANALY CHEM] A device used for emission flame photometry in which a compressed air aspirator vaporizes the solution within a chamber; smaller droplets are carried into the fuel-gas stream and to the burner orifice where the solvent is evaporated, dissociated, and optically excited. { 'lūn-də,gard 'vā-pə,rīz-ər }

lune [MATH] A section of a plane bounded by two circular arcs, or of a sphere bounded by two great circles. { 'lūn }

Luneberg lens [ELECTROMAG] A type of antenna consisting of a dielectric sphere whose index of refraction varies with distance from the center of the sphere so that a beam of parallel rays falling on the lens is focused at a point on the lens surface diametrically opposite from the direction of incidence, and, conversely, energy emanating from a point on the surface is focused into a plane wave. Accurately spelled Luneberg lens. { 'lū-nə,bərg ,lenz }

Luneberg lens See Luneberg lens. { 'lū-nə,bərg ,lenz }

lunette [GEOL] A broad, low crescentic mound of windblown fine silt and clay. [ORD] Towing ring in the trial plate or tongue of a towed vehicle, such as a gun carriage or trailer, used for attaching the towed vehicle to the prime mover or towing vehicle. { 'lū-net }

lung [ANAT] Either of the paired air-filled sacs, usually in the anterior or anteroventral part of the trunk of most tetrapods, which function as organs of respiration. { 'ləŋ }

lung bud [EMBRYO] A primary outgrowth of the embryonic trachea; the anlage of a primary bronchus and all its branches. { 'ləŋ ,bəd }

lungfish [VERT ZOO] The common name for members of the Dipnoi; all have lungs that arise from a ventral connection with the gut. { 'ləŋ ,fīsh }

lung-governed breathing apparatus [ENG] A breathing apparatus in which the oxygen that is supplied to the wearer is governed by the wearer's demand. { 'ləŋ ,gəv-ərnd 'brēθ-ŋ ap-ə-rad-əs }

lungworm [INV ZOO] Any of the nematodes that are parasites of terrestrial and marine nematodes, most commonly found in the respiratory tract, characterized by a reduced or absent stoma capsule, and an oral opening surrounded by six well-developed lips. { 'ləŋ ,wərm }

lunisolar precession [ASTROPHYS] Precession of the earth's